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Titan's Far-Infrared 220 cm⁻¹ Cloud Seen for the First Time in the South



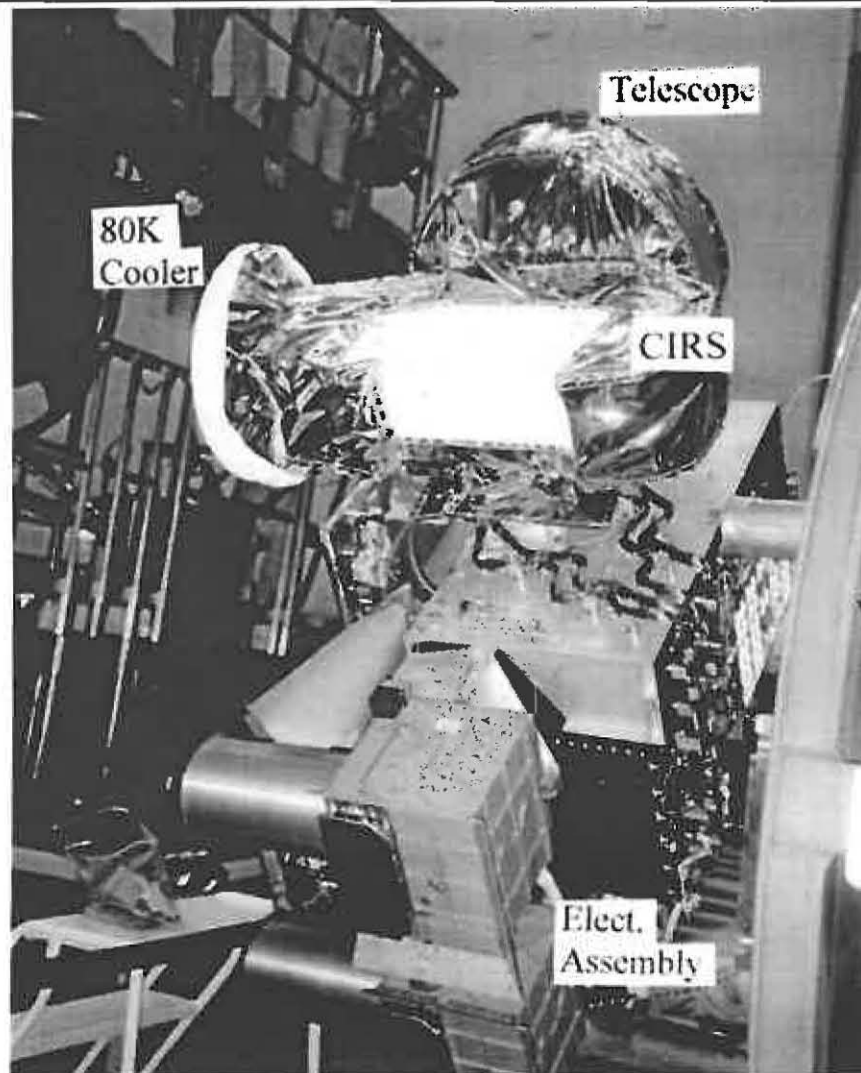
D. E. Jennings, C. M. Anderson, R. E. Samuelson,
C. A. Nixon, F. M. Flasar, N. A. Teanby, R. de Kok,
A. Coustenis, S. Vinatier

EGU General Assembly 2013
Vienna, Austria
7-12 April 2013

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CIRS on Cassini

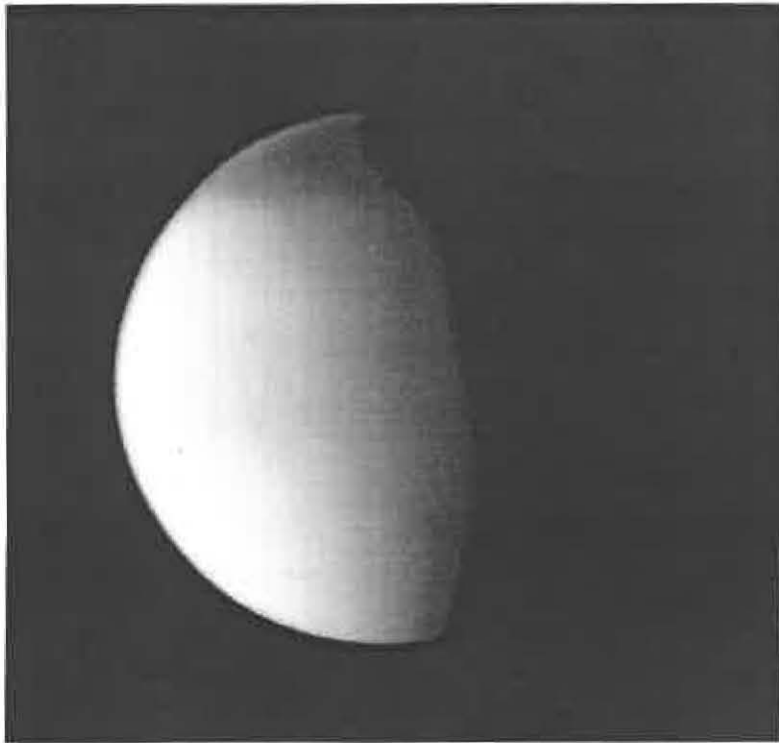


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Titan's polar haze

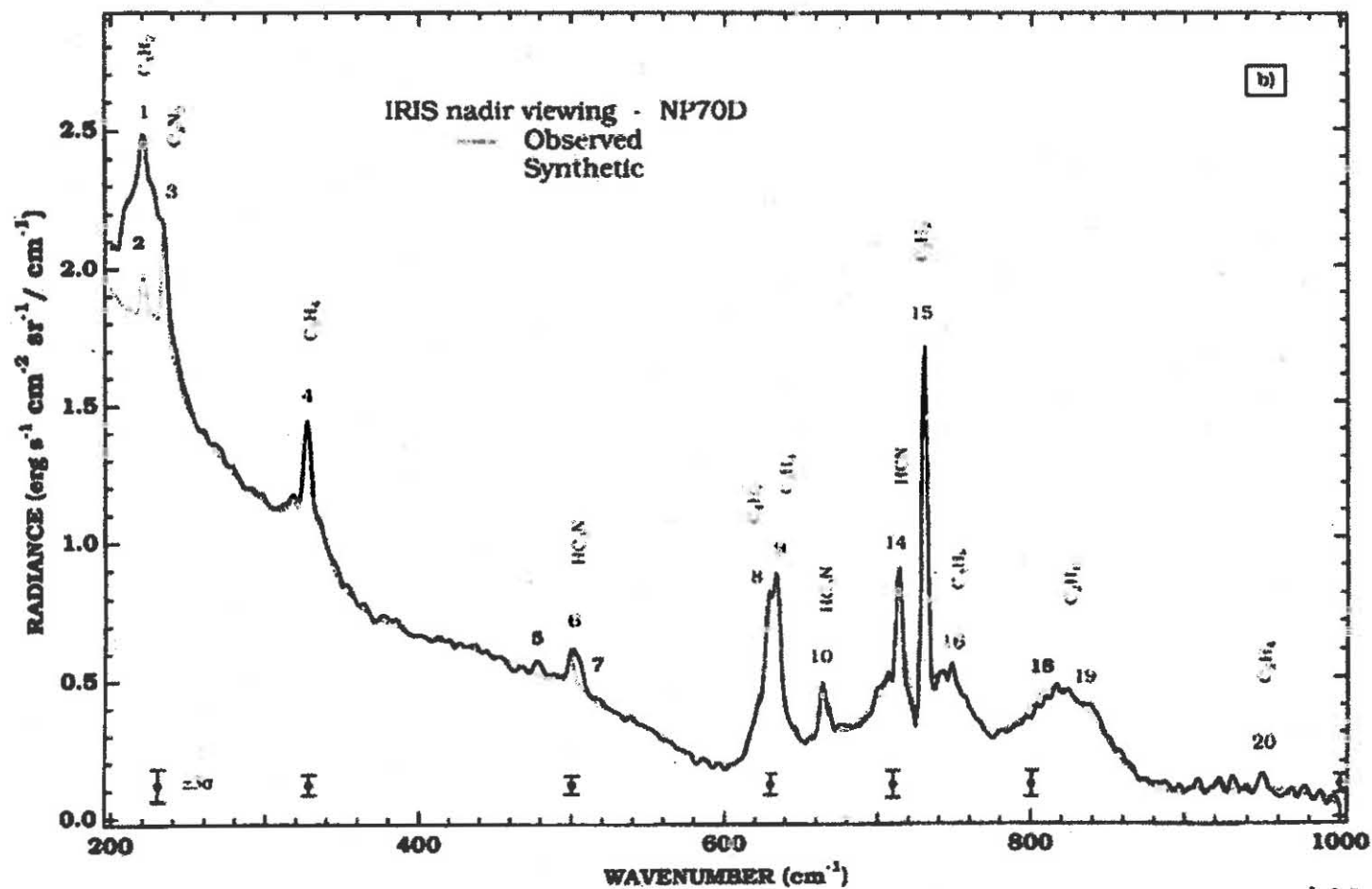
ISS 13 Aug 2009



ISS 18 Jul 2012



220 cm^{-1} emission feature in North originally found by Voyager

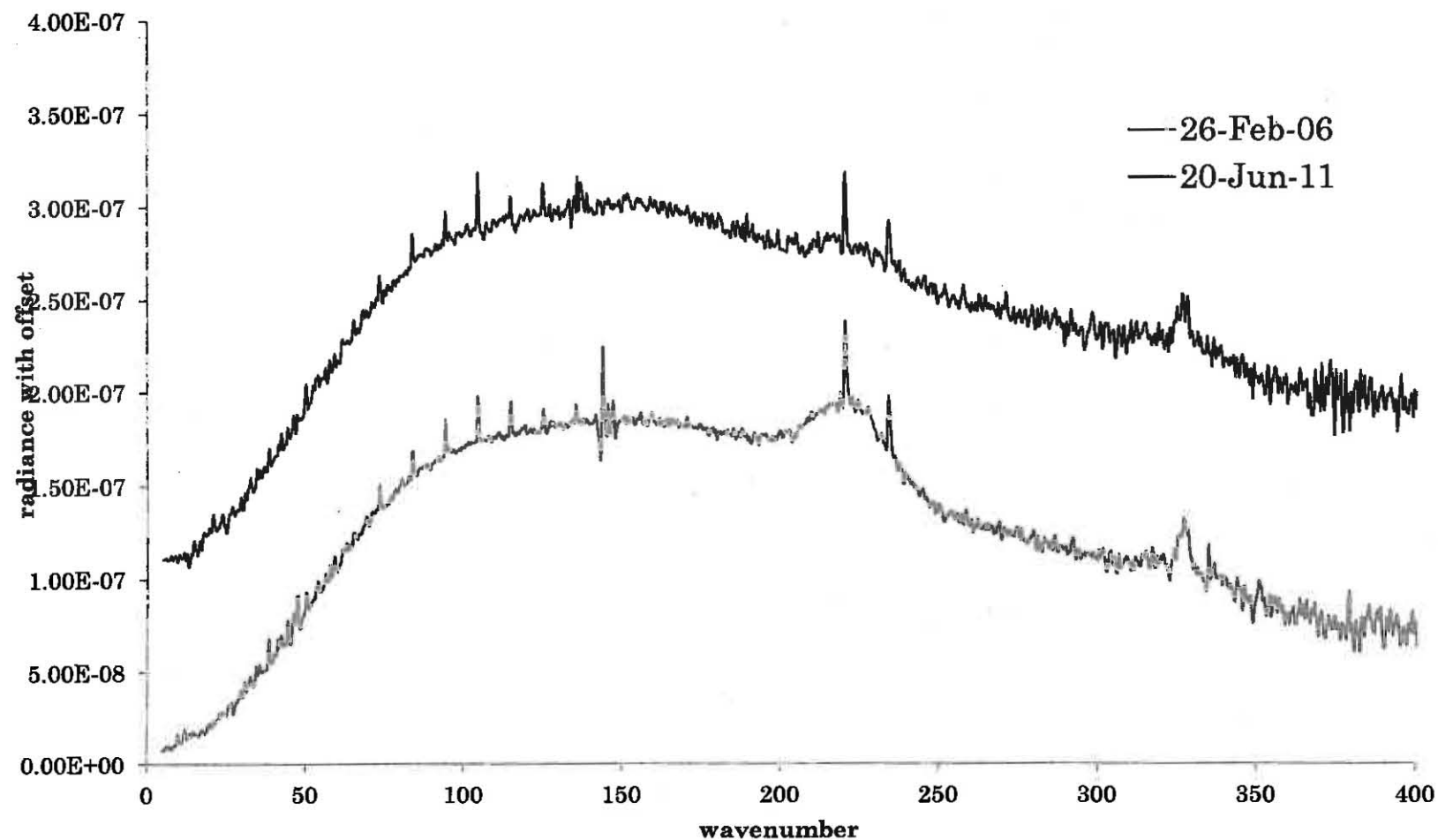


From Coustenis et al. 1999

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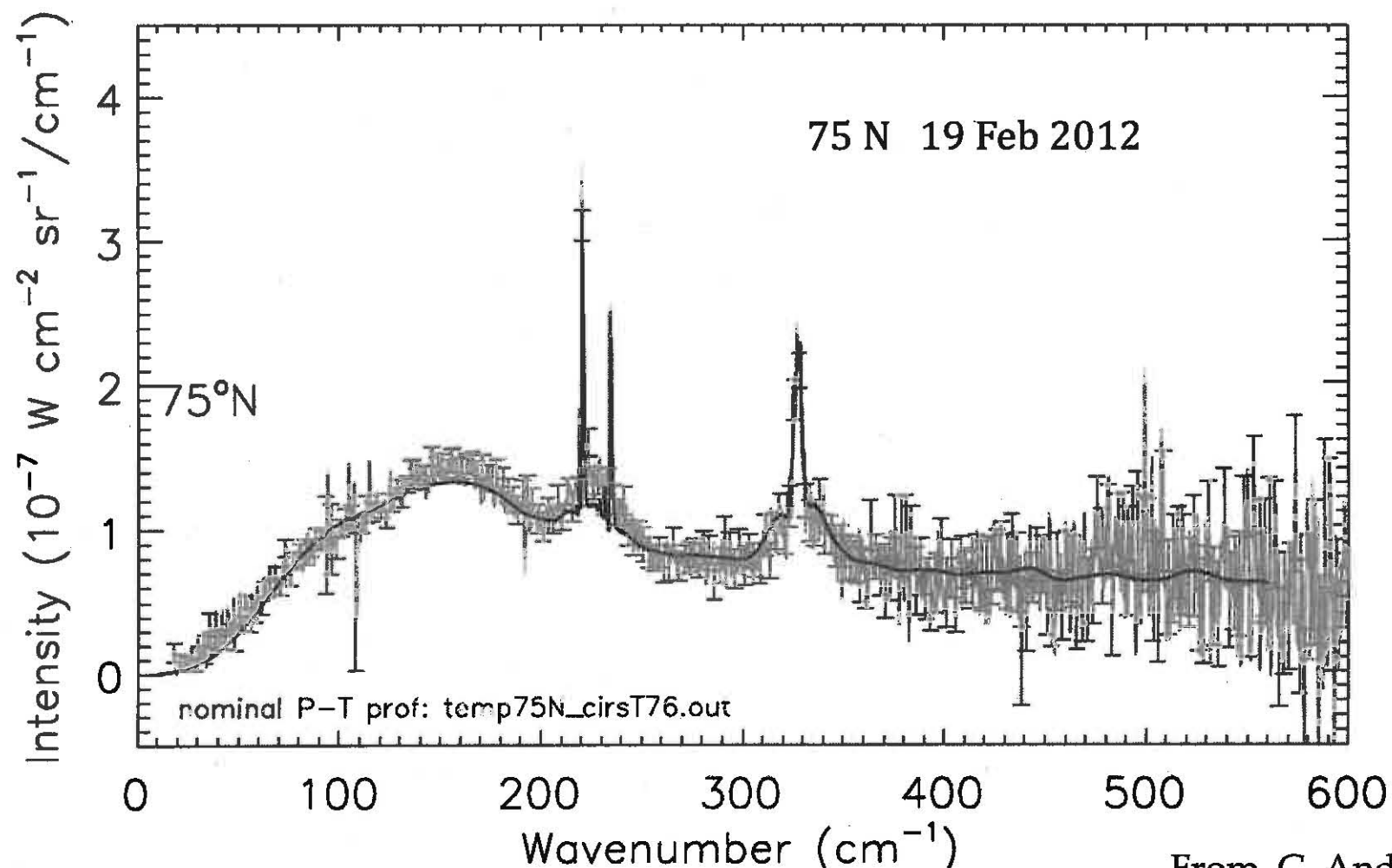
220 cm^{-1} feature with CIRS high resolution (0.5 cm^{-1})



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Use model without 220 cm^{-1} haze to
estimate contribution of C_4H_2 and C_2N_2

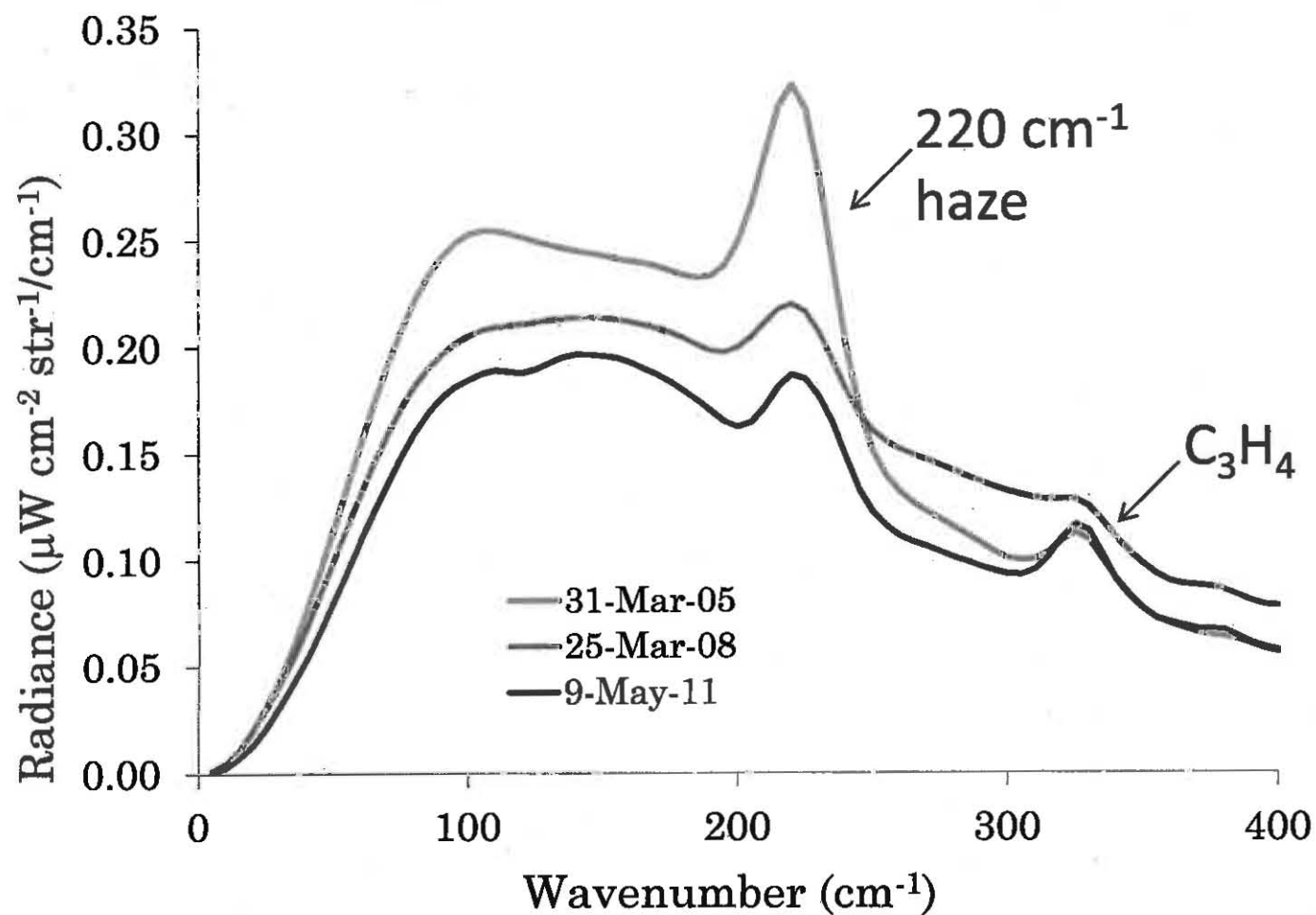


From C. Anderson

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Change in 220 cm⁻¹ emission over Cassini mission

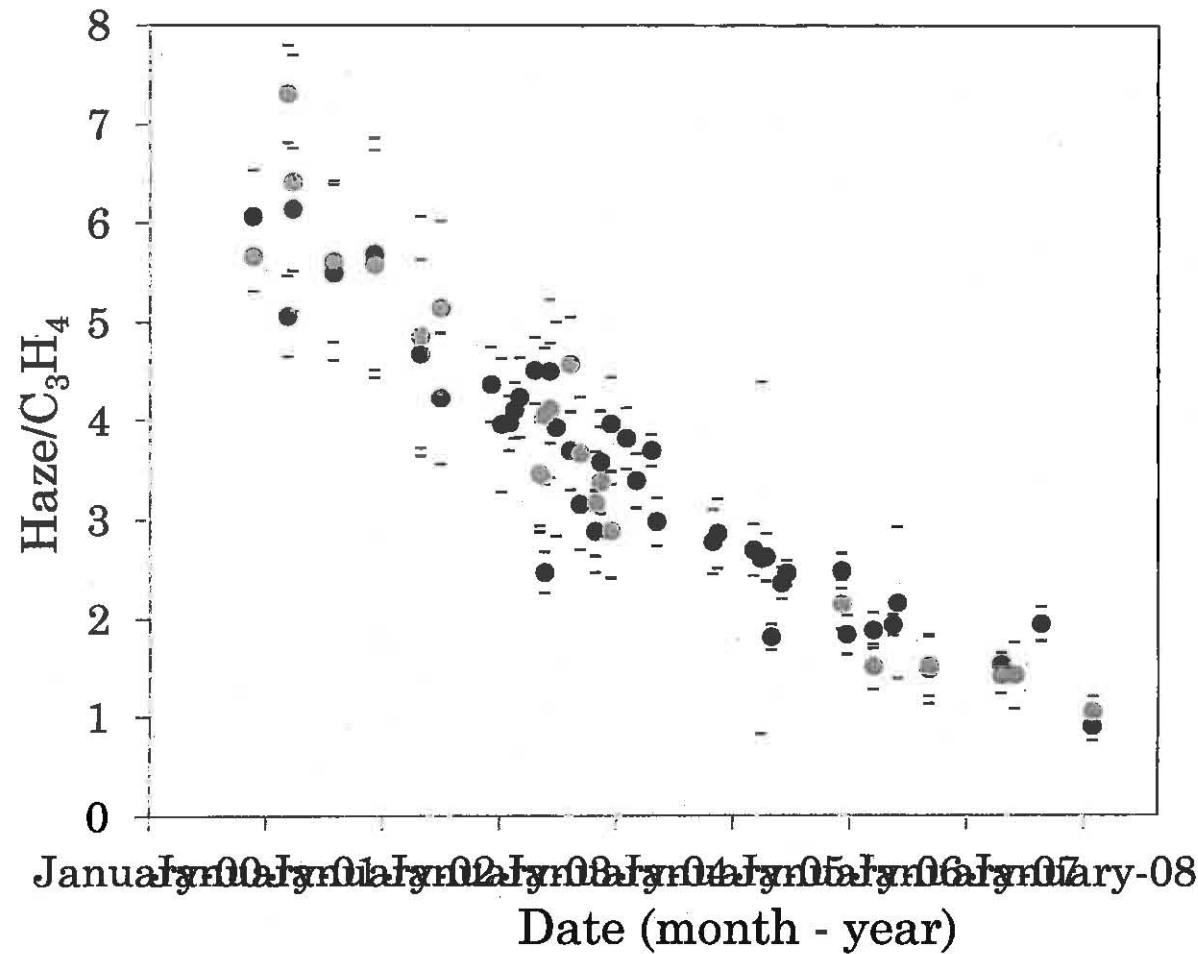


Jennings et al., ApJ Letters, ApJ, 754, L3 (2012)

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220 cm^{-1} emission in North has gradually decreased since Cassini's arrival

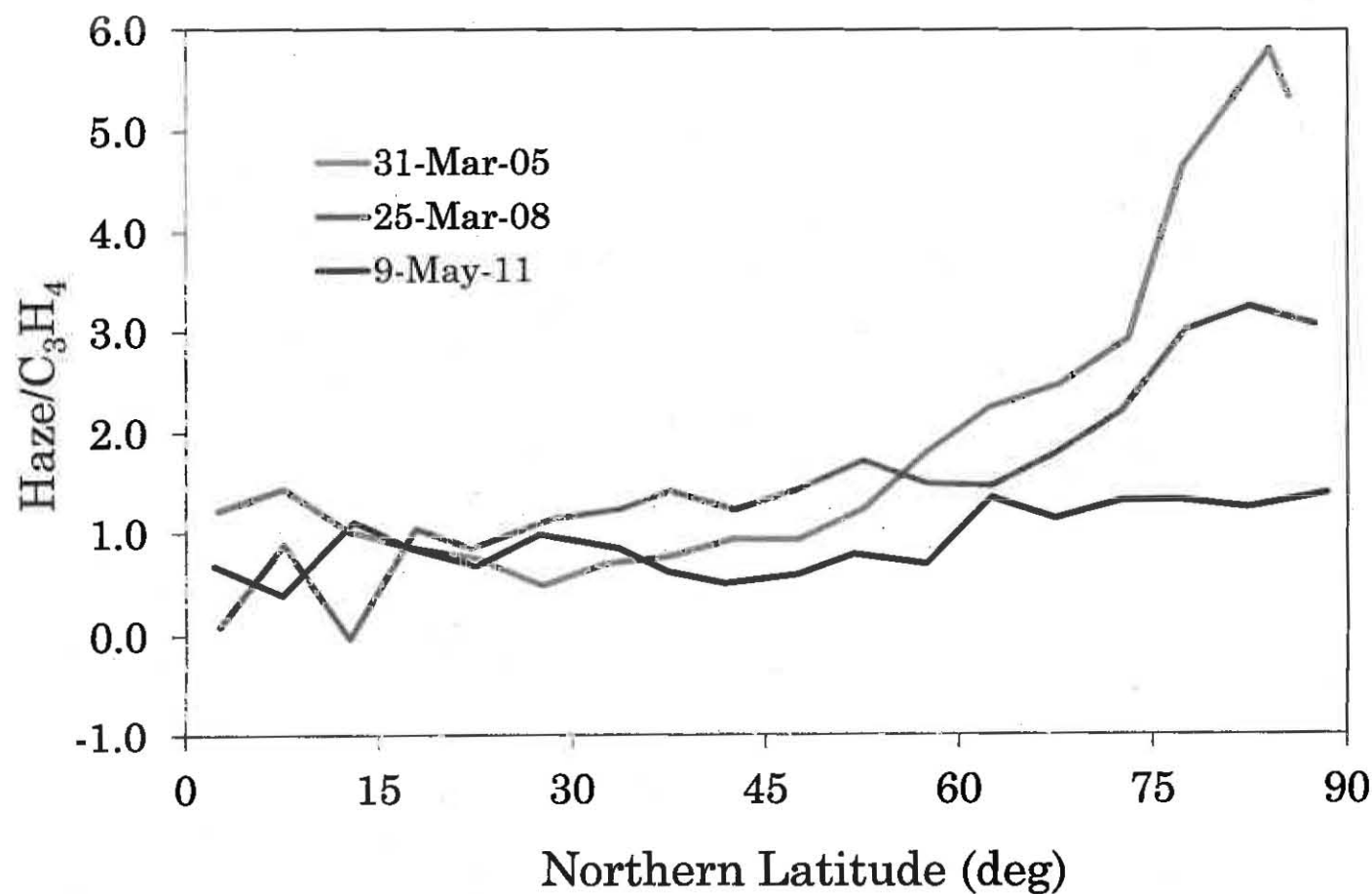


From Jennings et al. 2012

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Latitude dependence of 220 cm^{-1} intensity decrease over time in North



From Jennings et al. 2012

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Formation of haze hood and vortex at Titan's South Pole in 2011-12

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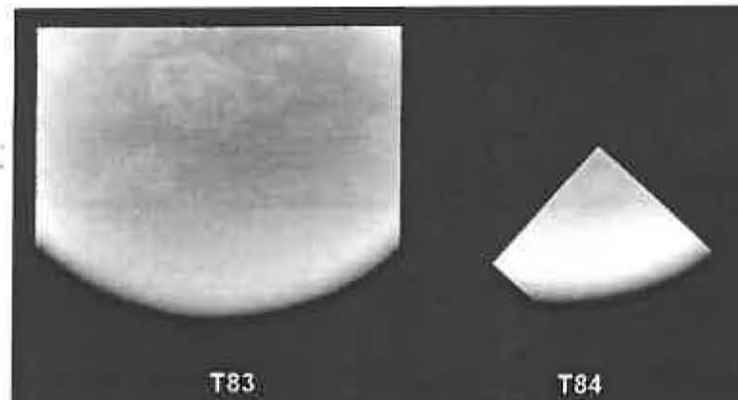


Sep 2011
ISS



Jun 2012
ISS

May-Jun 2012
VIMS



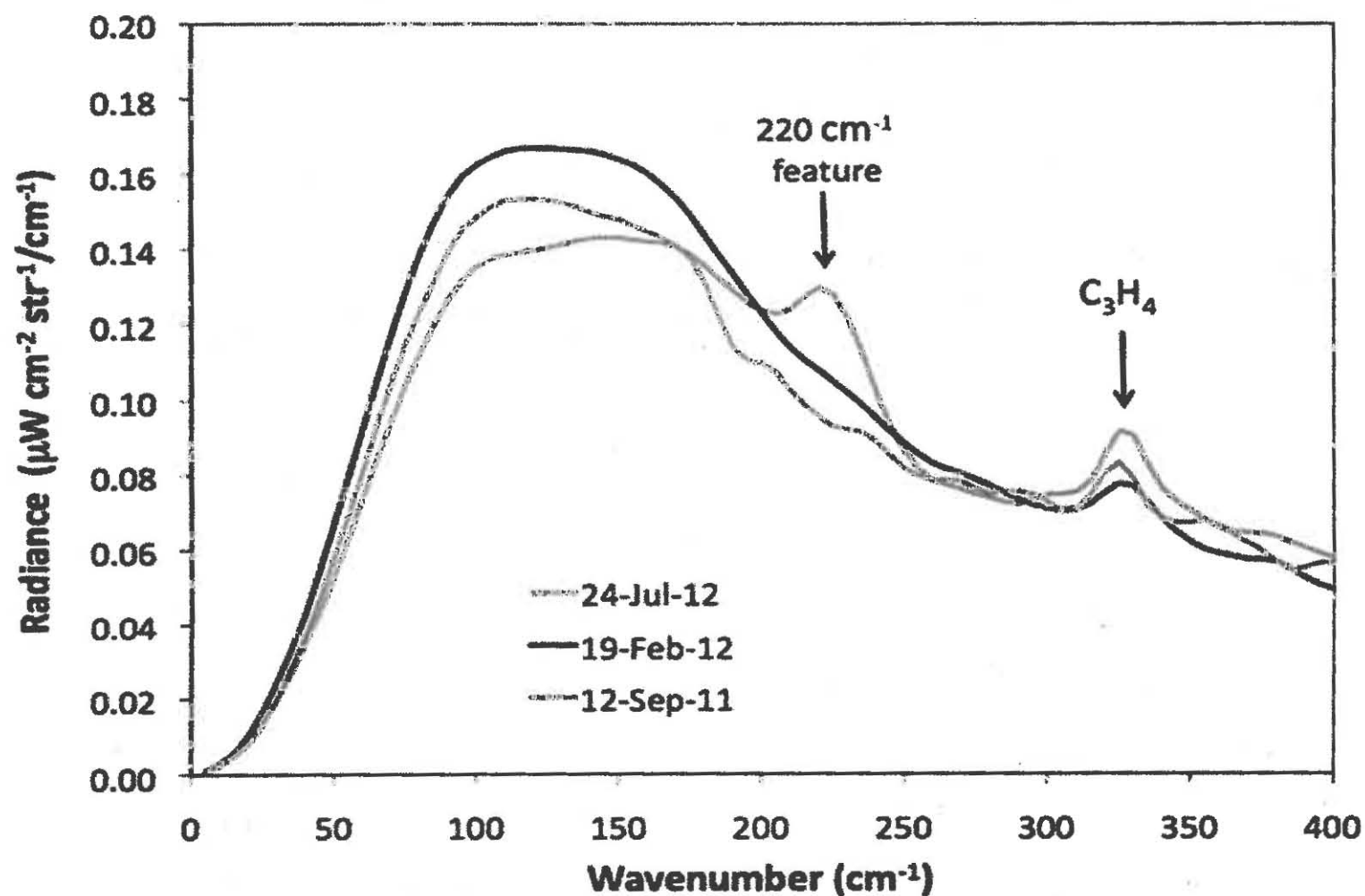
T83

T84

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220 cm^{-1} emission in South first seen in July 2012

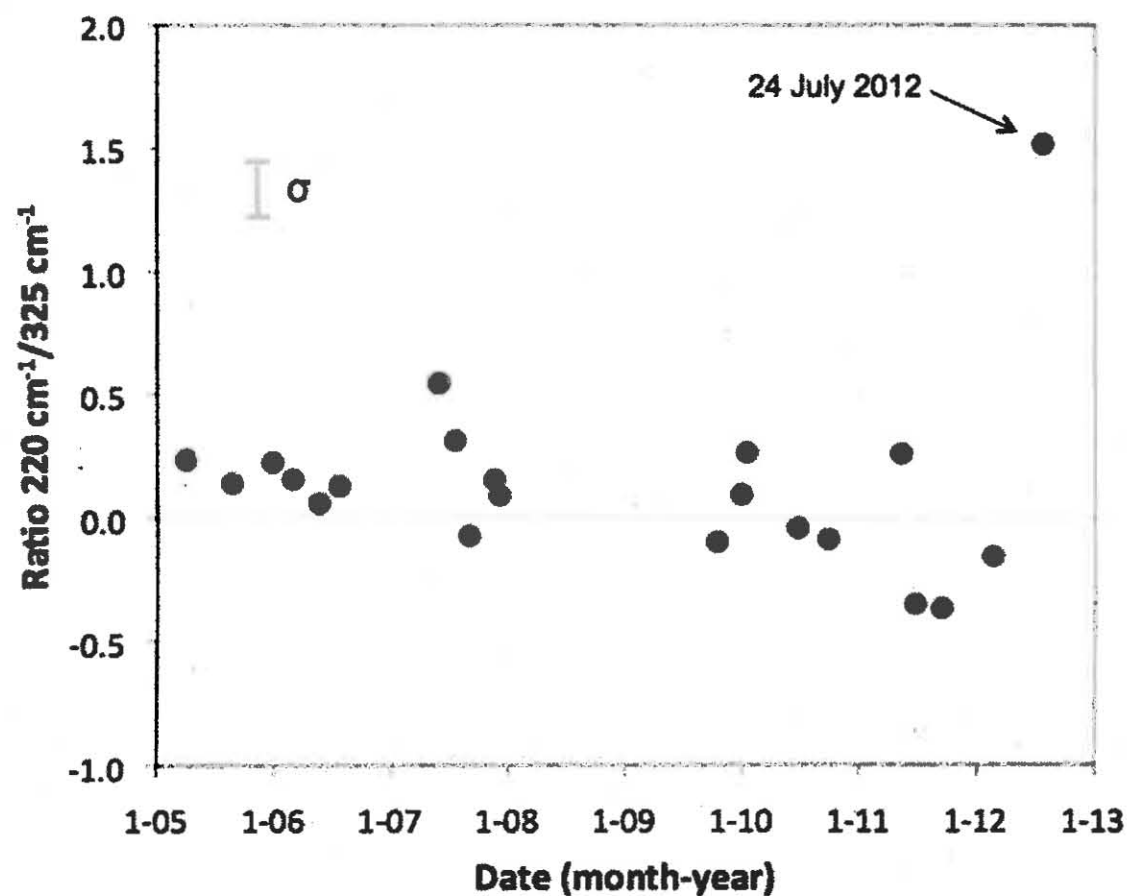
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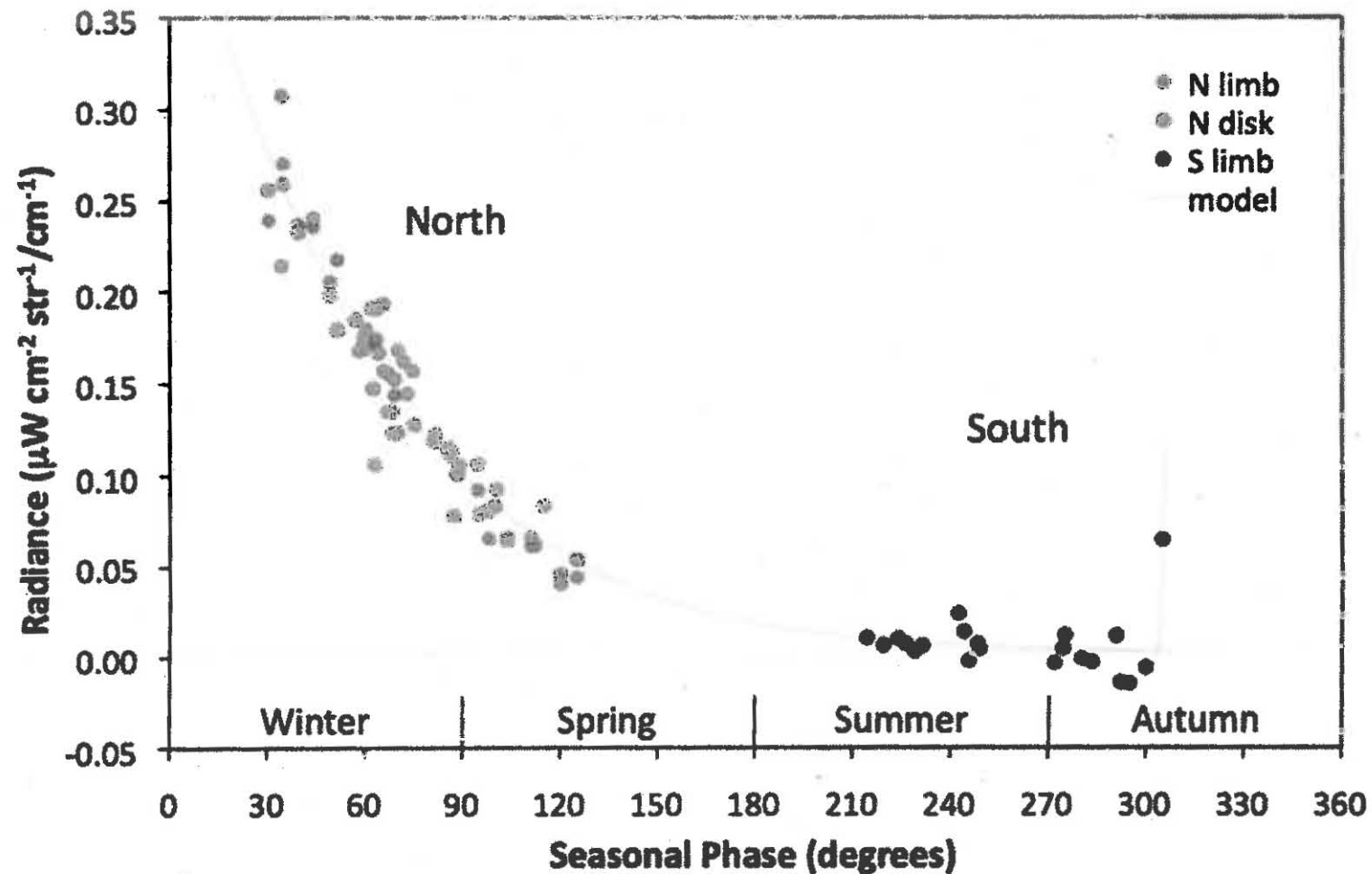
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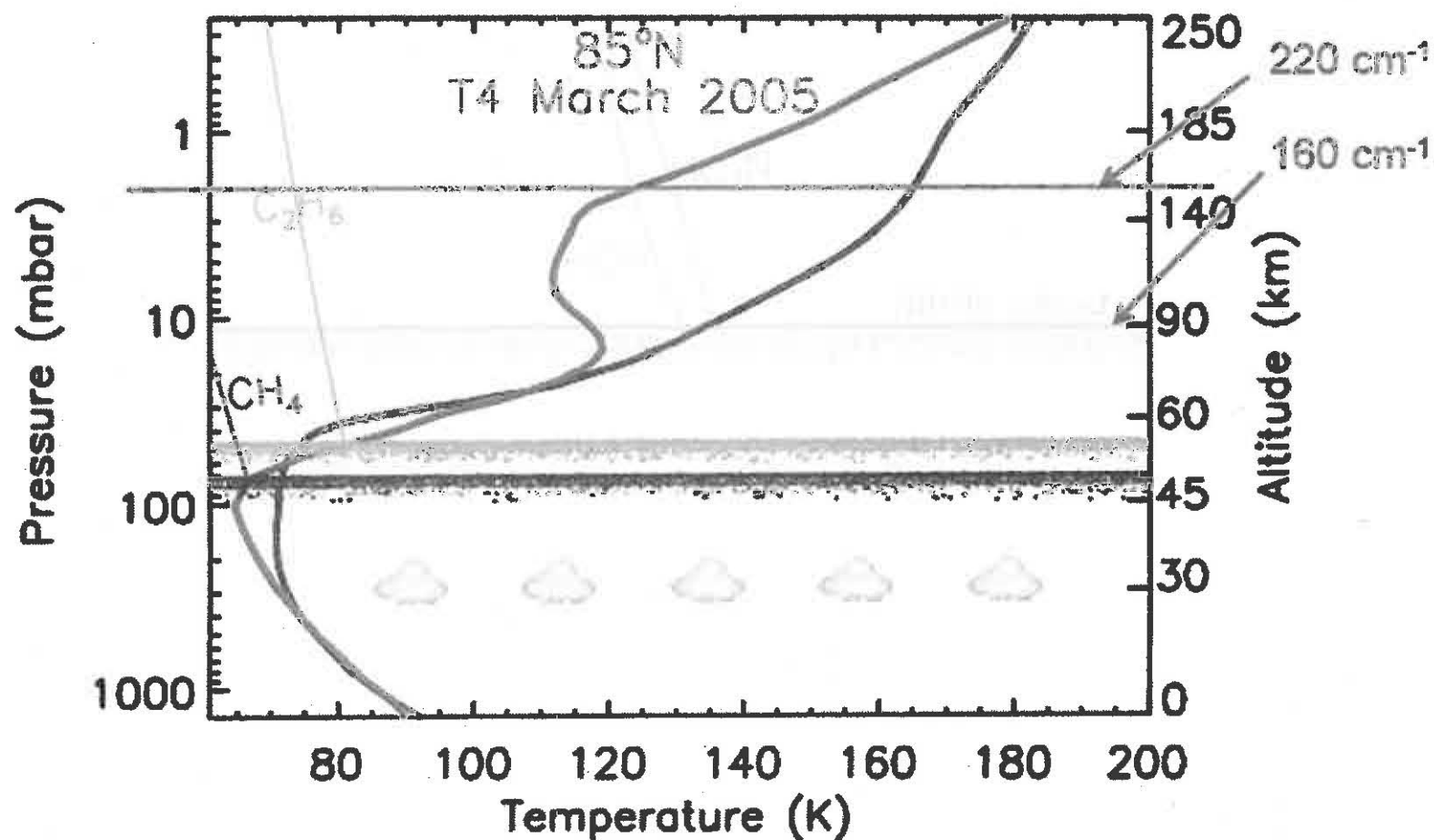
220 cm⁻¹ intensity in South increased abruptly in mid-2012



North and South data on common seasonal scale



Depressed stratospheric temperatures move nitrile condensation to higher altitudes

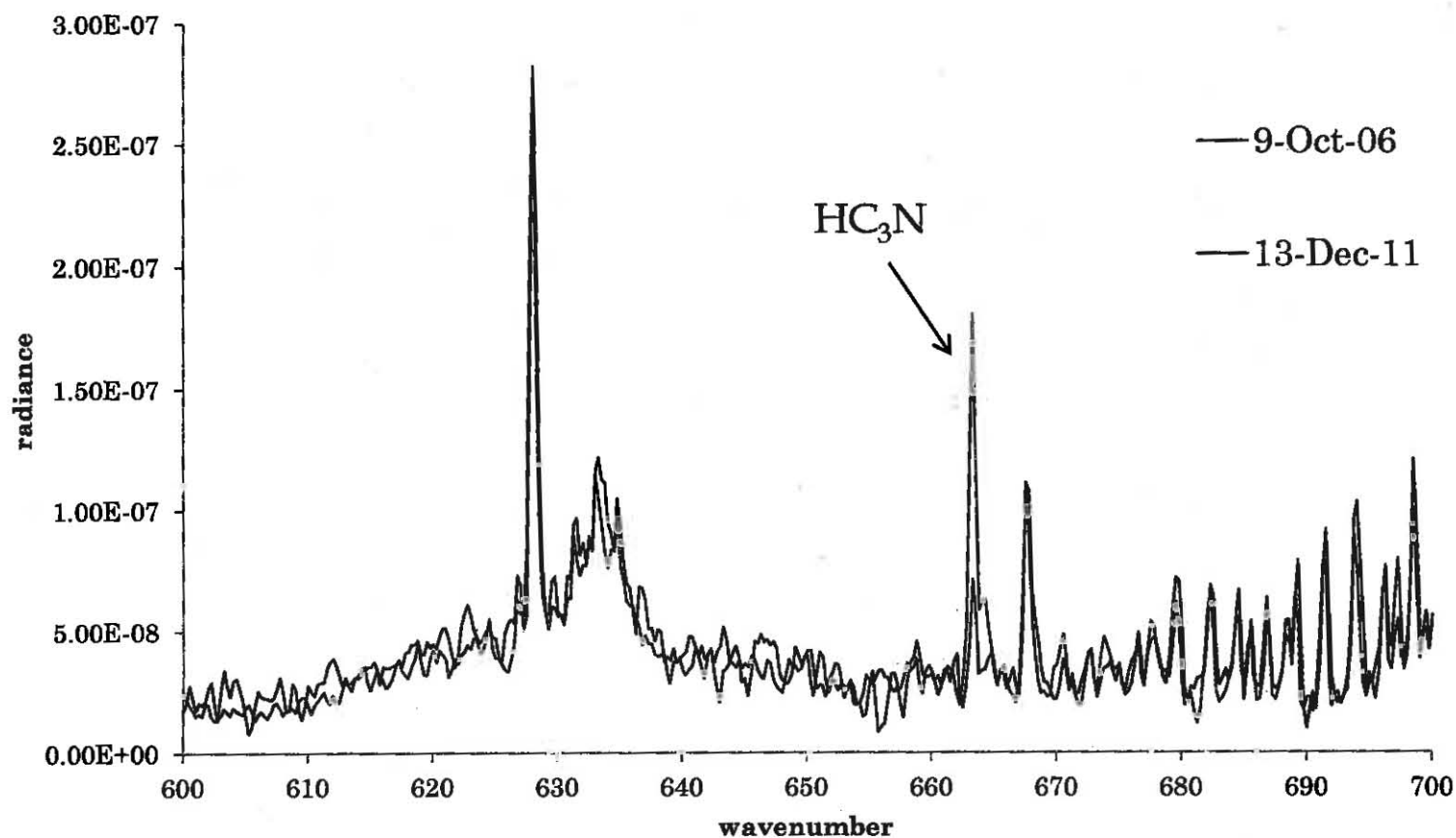


Adapted from C. Anderson et al.

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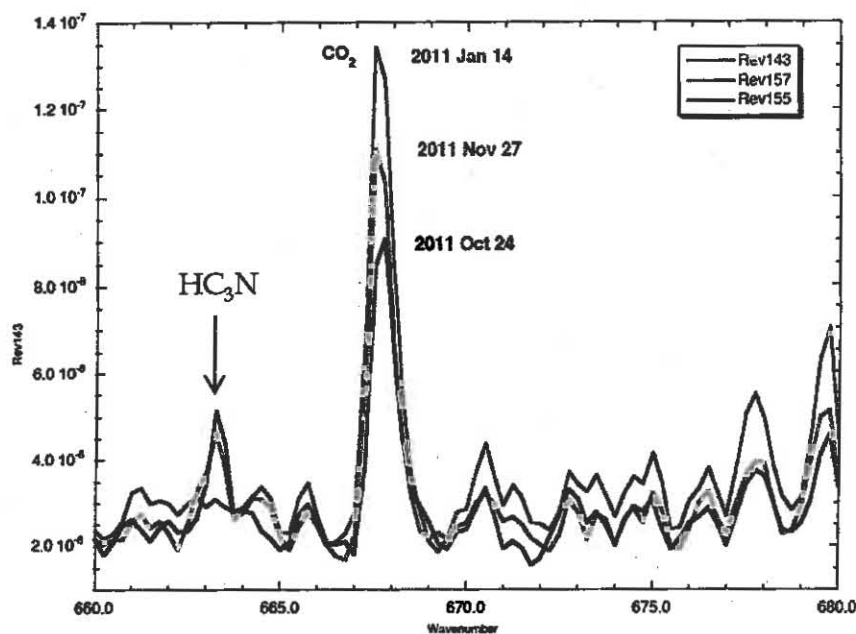
HC₃N emission in North has also decreased over Cassini mission



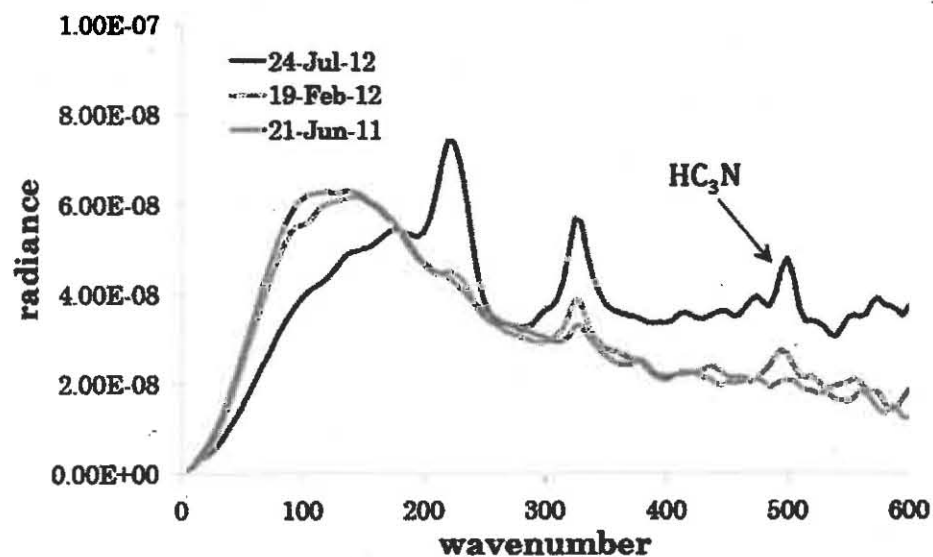
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HC₃N began increasing in South in late 2011 before the 220 cm⁻¹ haze



From G. Bjoraker



HC₃N appeared at the South Pole in late 2011 at about the same time as the haze hood

Summary

- In North, the 220 cm^{-1} haze emission has decreased by about x4 since the beginning of the Cassini mission. Haze decay shows a lifetime of 4.4 years.
- In South, haze made a sudden appearance in 2012, just after a south polar hood and vortex began developing in the south.
- Gaseous HC_3N seems to be following the same seasonal trend as the 220 cm^{-1} emission in both North and South. Implication: 220 cm^{-1} material is of nitrile origin.
- Haze in 2010 was consistent with Voyager results from one Titan year earlier.

